Self Driving Car

Presentation by:

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Introduction

Self driving car

Mission

Our mission is to create a self driving car, that can navigate through a restaurant environment, avoiding obstacles and going from point A to point B

Hardware

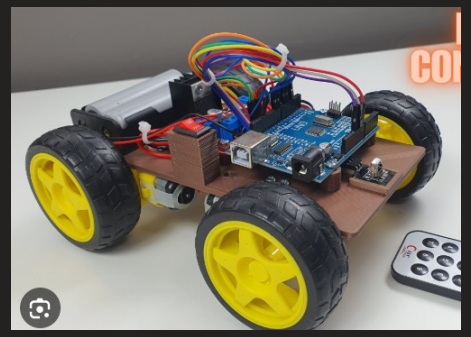
Hardware Components

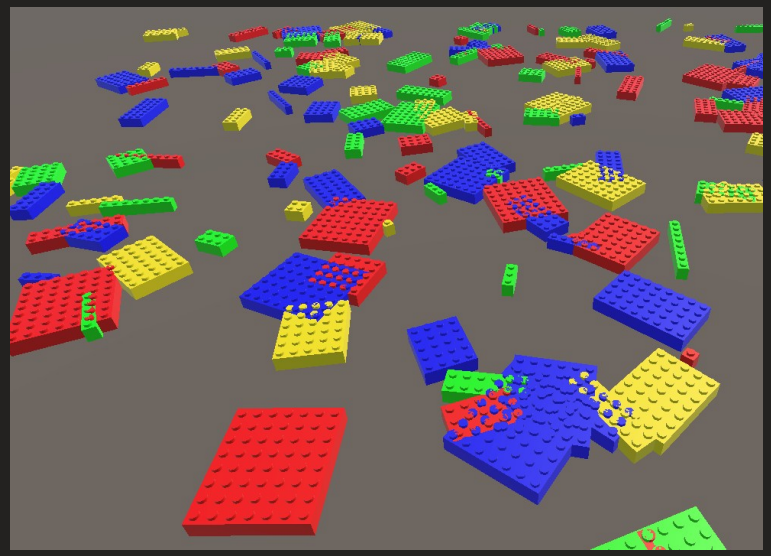
Esp32

Android Phone

Webcam

Laptop



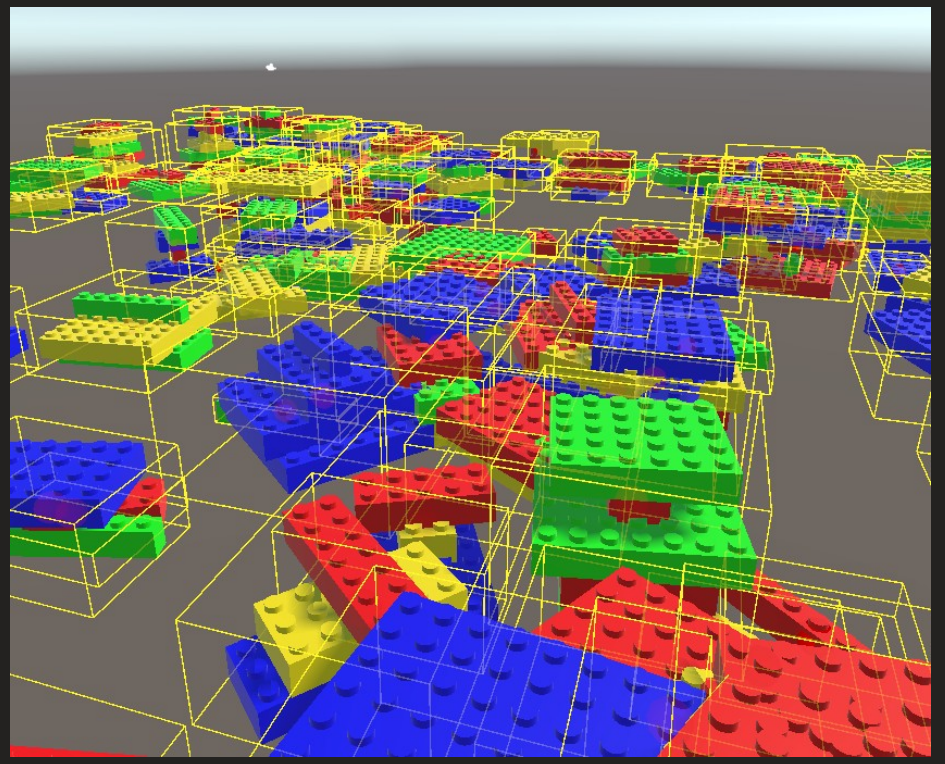


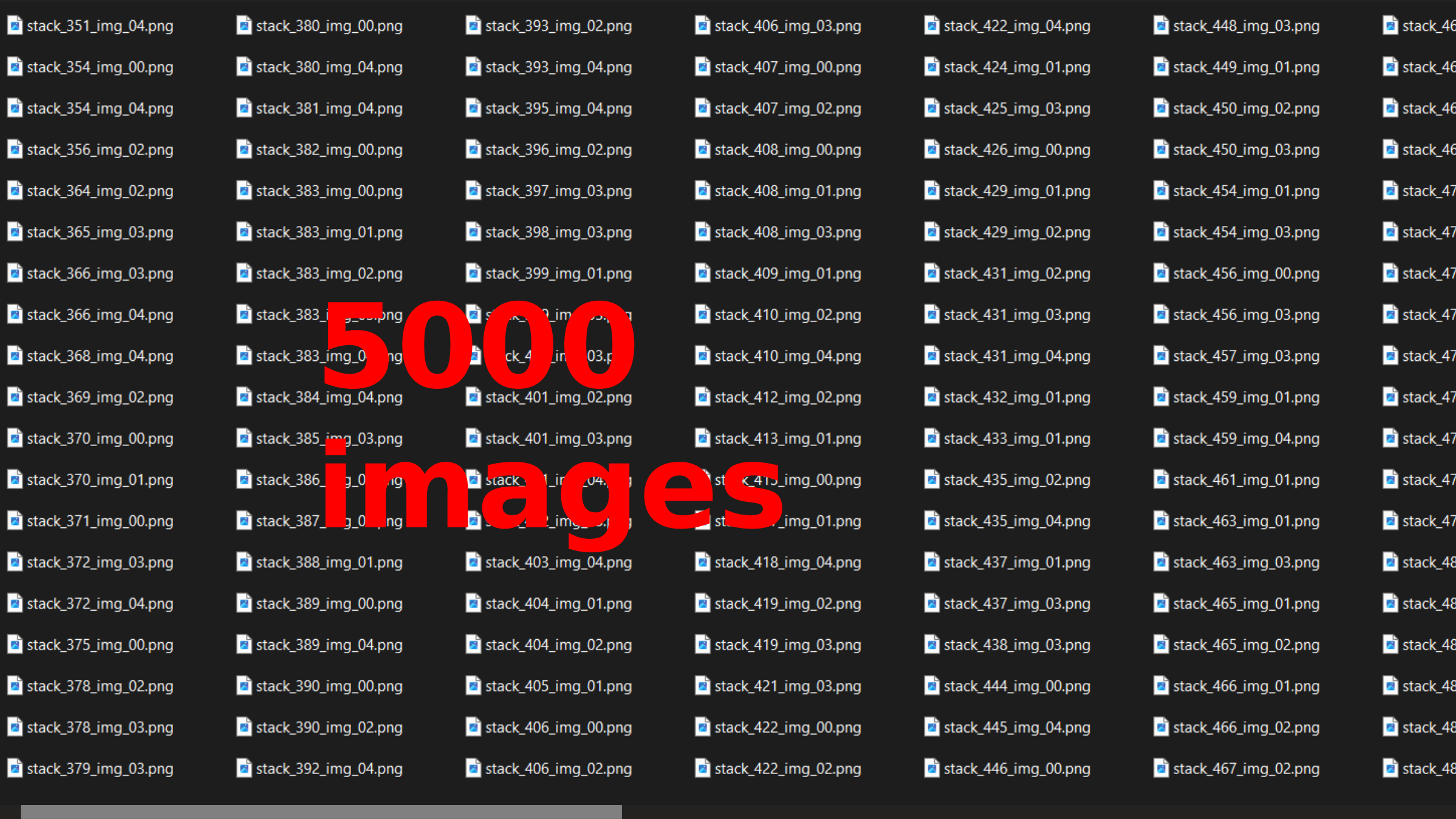
Data Generation

Data Labeling

```
81 0.492568 0.361194 0.345482 0.312482
81 0.498490 0.435113 0.178062 0.167311
81 0.498929 0.489280 0.146273 0.138987
81 0.499120 0.545958 0.111538 0.114596
81 0.497825 0.598909 0.194652 0.146433
```

class_id | center_x | center_y | width | height




stack_351_img_04.png
stack_354_img_00.png
stack_354_img_04.png
stack_356_img_02.png
stack_364_img_02.png
stack_365_img_03.png
stack_366_img_03.png
stack_366_img_04.png
stack_368_img_04.png
stack_369_img_02.png
stack_370_img_00.png
stack_370_img_01.png
stack_371_img_00.png
stack_372_img_03.png
stack_372_img_04.png
stack_375_img_00.png
stack_378_img_02.png
stack_378_img_03.png
stack_379_img_03.png
stack_380_img_00.png
stack_380_img_04.png
stack_381_img_04.png
stack_382_img_00.png
stack_383_img_00.png
stack_383_img_01.png
stack_383_img_02.png
stack_384_img_04.png
stack_388_img_01.png
stack_389_img_00.png
stack_389_img_04.png
stack_390_img_00.png
stack_390_img_02.png
stack_392_img_04.png
stack_393_img_02.png
stack_393_img_04.png
stack_395_img_04.png
stack_396_img_02.png
stack_397_img_03.png
stack_398_img_03.png
stack_399_img_01.png
stack_401_img_02.png
stack_401_img_03.png
stack_403_img_04.png
stack_404_img_01.png
stack_404_img_02.png
stack_405_img_01.png
stack_406_img_00.png
stack_406_img_02.png
stack_406_img_03.png
stack_407_img_00.png
stack_407_img_02.png
stack_408_img_00.png
stack_408_img_01.png
stack_408_img_03.png
stack_409_img_01.png
stack_410_img_02.png
stack_410_img_04.png
stack_412_img_02.png
stack_413_img_01.png
stack_418_img_04.png
stack_419_img_02.png
stack_419_img_03.png
stack_421_img_03.png
stack_422_img_00.png
stack_422_img_02.png
stack_422_img_04.png
stack_424_img_01.png
stack_425_img_03.png
stack_426_img_00.png
stack_429_img_01.png
stack_429_img_02.png
stack_431_img_02.png
stack_431_img_03.png
stack_431_img_04.png
stack_432_img_01.png
stack_433_img_01.png
stack_435_img_02.png
stack_435_img_04.png
stack_437_img_01.png
stack_437_img_03.png
stack_438_img_03.png
stack_444_img_00.png
stack_445_img_04.png
stack_446_img_00.png
stack_448_img_03.png
stack_449_img_01.png
stack_450_img_02.png
stack_450_img_03.png
stack_454_img_01.png
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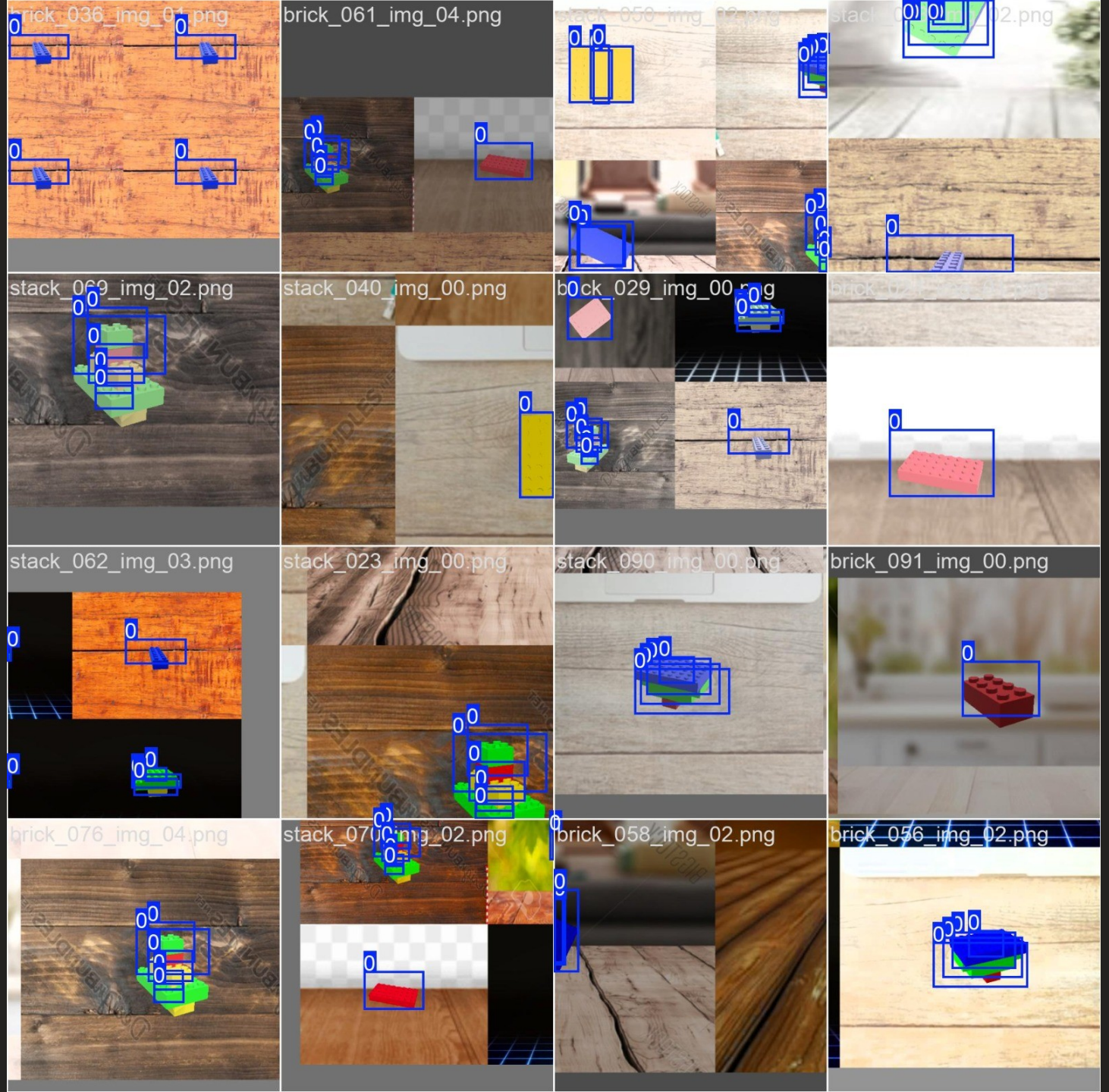
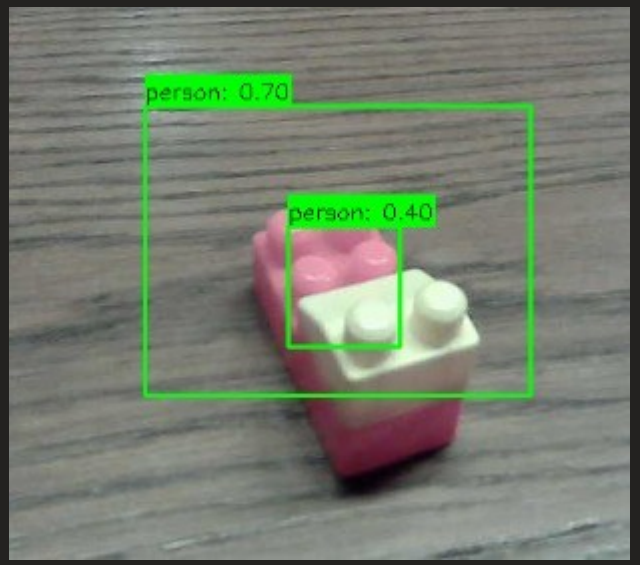
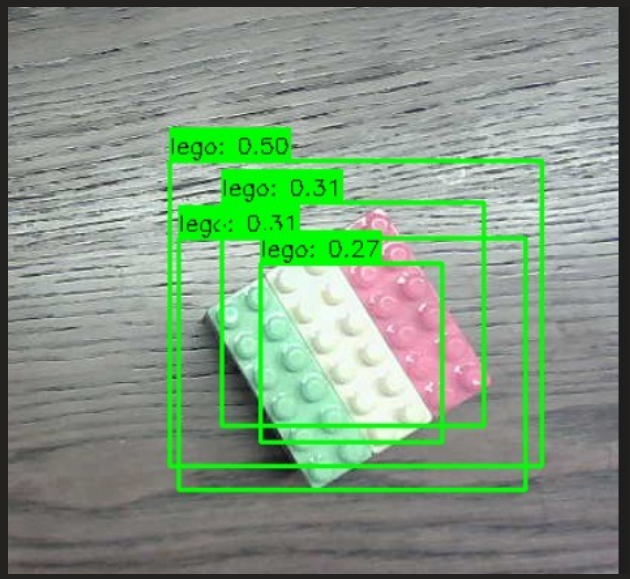
stack_463_img_03.png
stack_465_img_01.png
stack_465_img_02.png
stack_466_img_01.png
stack_466_img_02.png
stack_467_img_02.png
5000
images

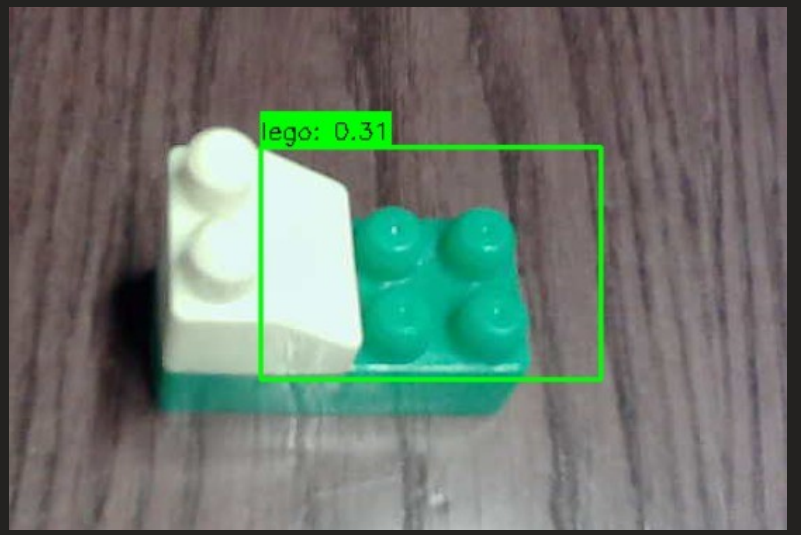

5000
labels

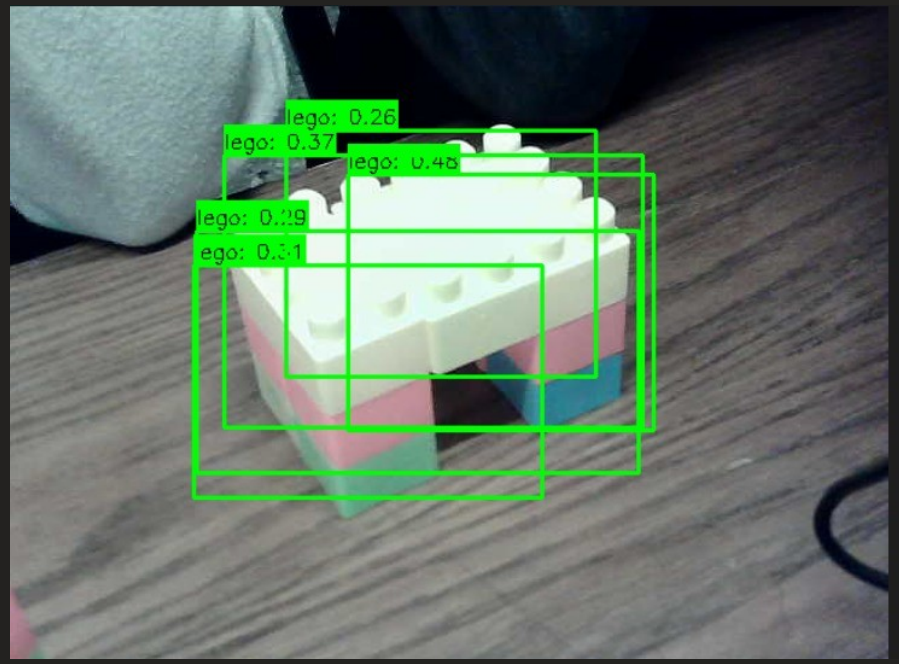

stack_056_img_03.png
brick_012_img_02.png
brick_096_img_04.png
brick_000_img_04.png
brick_020_img_02.png
brick_062_img_00.png
stack_055_img_01.png


brick_061_img_04.png
stack_069_img_02.png
stack_040_img_00.png
stack_062_img_03.png
stack_023_img_00.png
stack_090_img_00.png
brick_091_img_00.png
brick_076_img_04.png
brick_058_img_02.png
brick_056_img_02.png

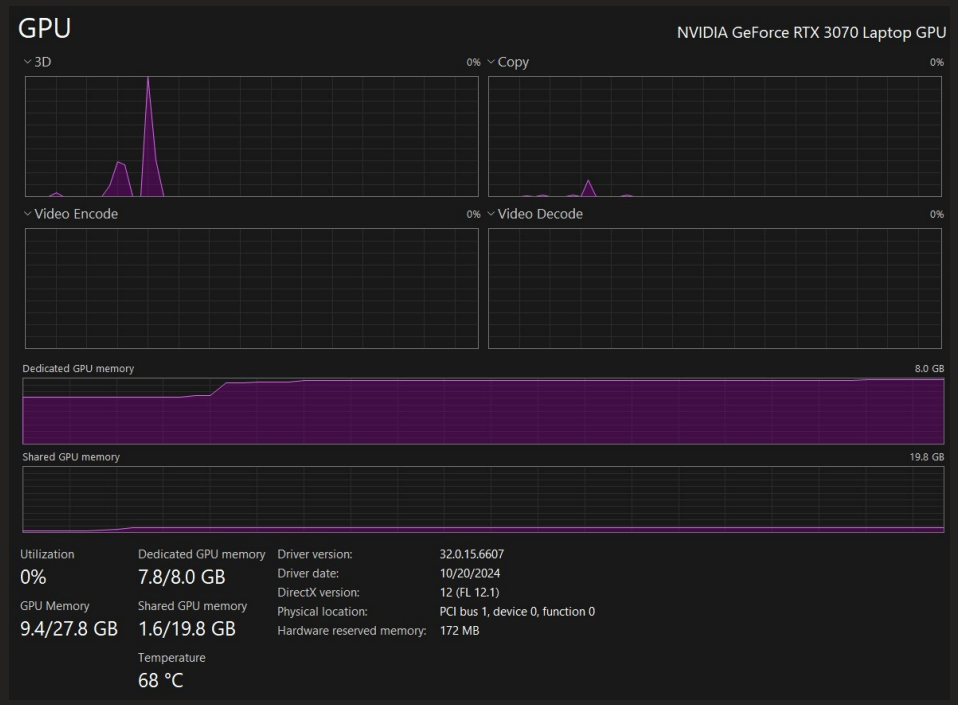

person: 0.70
person: 0.40


lego: 0.50
lego: 0.31
lego: 0.27


lego: 0.31

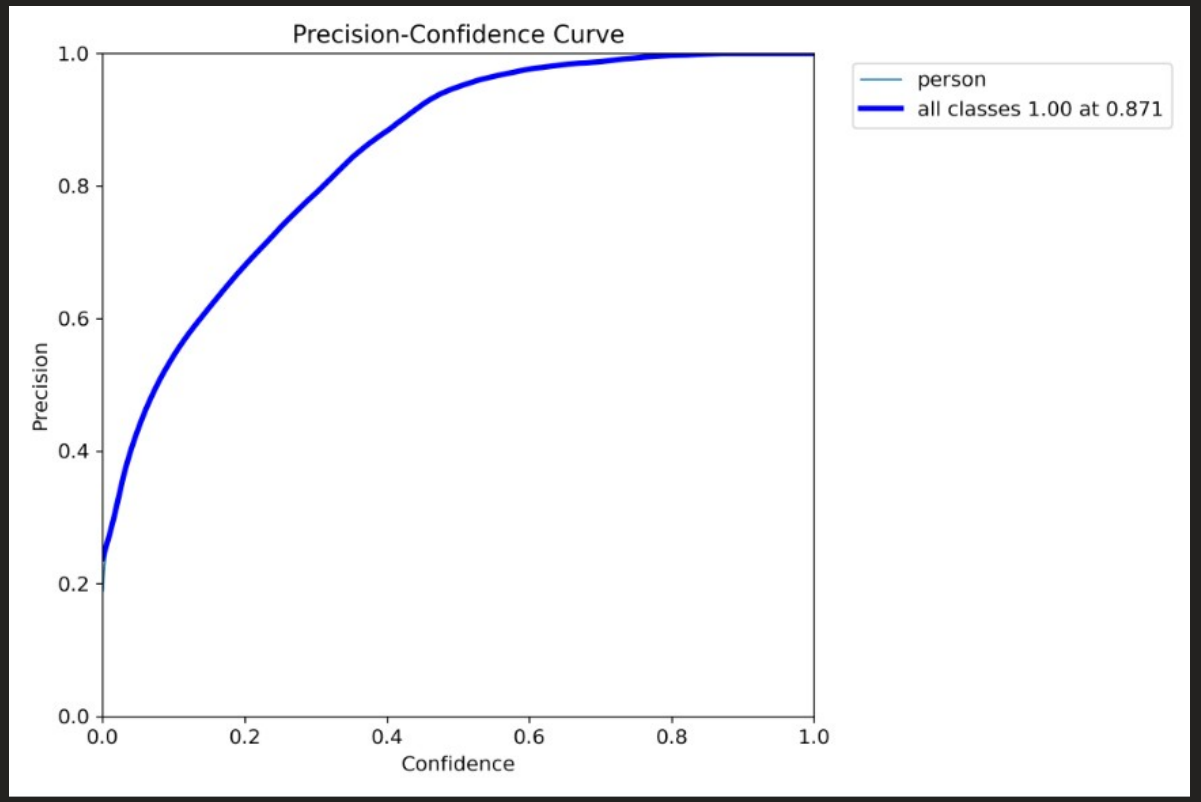

lego: 0.26
lego: 0.37

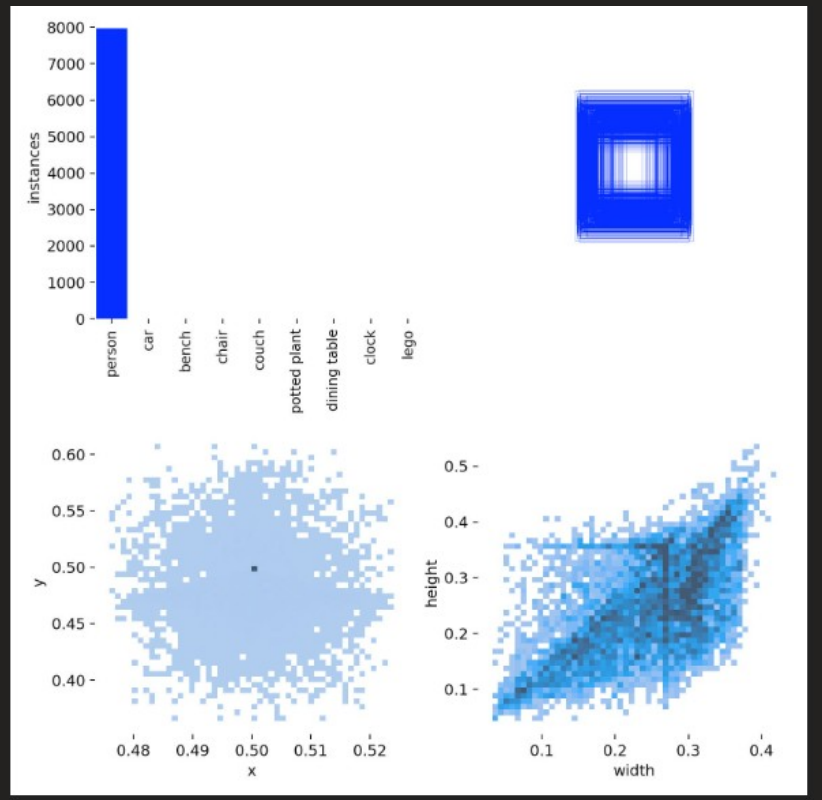
```
train: Scanning /mnt/d/Zaka.ai/wsl/Datasets/train/labels... 4000 images, 0 backgrounds, 0 corrupt: 100%| | 4000/4000 [00:15
train: New cache created: /mnt/d/Zaka.ai/wsl/Datasets/train/labels.cache
val: Scanning /mnt/d/Zaka.ai/wsl/Datasets/test/labels... 1000 images, 0 backgrounds, 0 corrupt: 100%| | 1000/1000 [00:05<00
val: New cache created: /mnt/d/Zaka.ai/wsl/Datasets/test/labels.cache
Plotting labels to runs/detect/train17/labels.jpg...
optimizer: 'optimizer=auto' found, ignoring 'lr0=0.01' and 'momentum=0.937' and determining best 'optimizer', 'lr0' and 'momentum' a
utomatically...
optimizer: AdamW(lr=0.000769, momentum=0.9) with parameter groups 57 weight(decay=0.0), 64 weight(decay=0.0005), 63 bias(decay=0.0)
TensorBoard: model graph visualization added ✅
Image sizes 640 train, 640 val
Using 8 dataloader workers
Logging results to runs/detect/train17
Starting training for 50 epochs...

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
       1/50      2.08G       2.05      3.969      1.911         76        640:  21%|          | 52/250 [00:12<00:25,  7.63it/s]
```

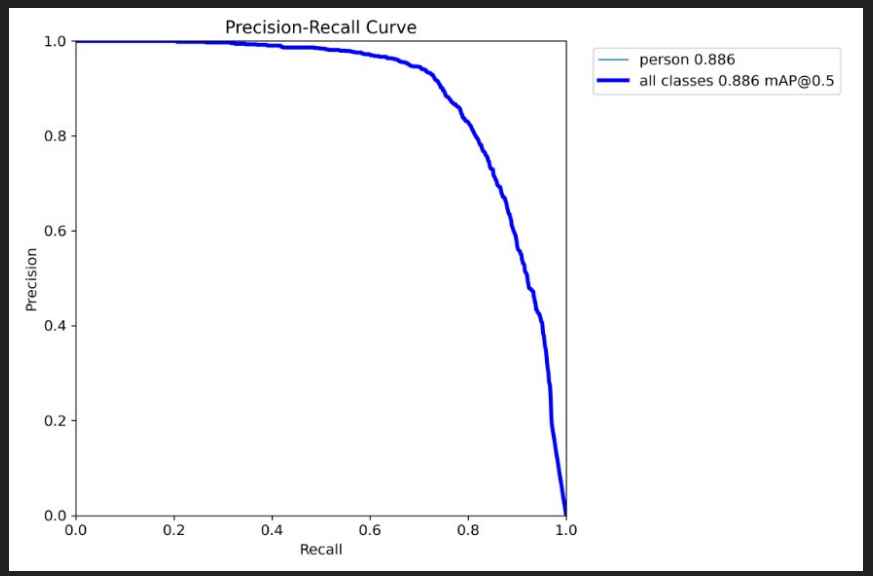


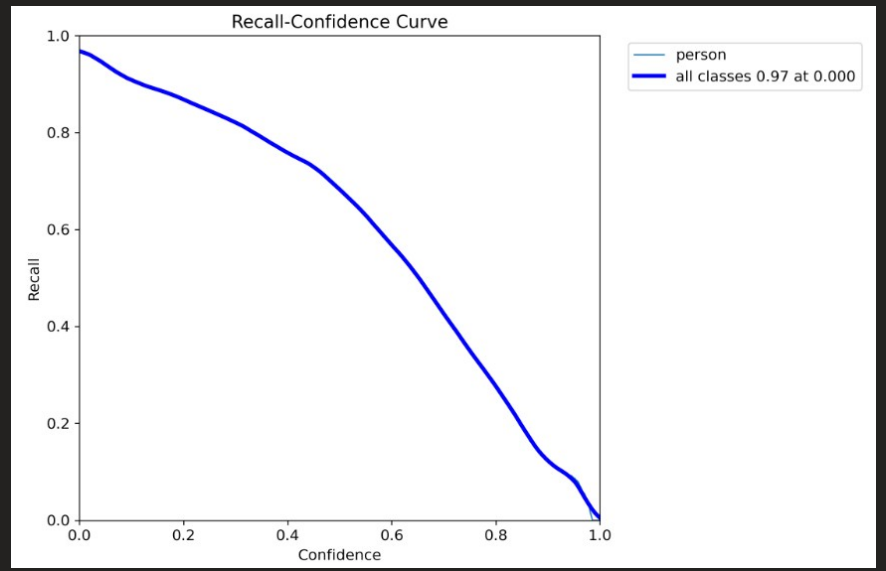
dataset.yaml

```yaml
path: "/mnt/d/Zaka.ai/wsl/Datasets"
train: train/images
val: test/images
nc: 81
names: {
    0: 'person',
    1: 'bicycle',
    2: 'car',
    3: 'motorcycle',
    4: 'airplane',
    5: 'bus',
    6: 'train',
    7: 'truck',
    8: 'boat',
    9: 'traffic light',
    10: 'fire hydrant',
    11: 'stop sign',
    12: 'parking meter',
    13: 'bench',
    14: 'bird',
    15: 'cat',
    16: 'dog',
    17: 'horse',
    18: 'sheep',
    19: 'cow',
    20: 'elephant',
    21: 'bear',
    22: 'zebra',
    23: 'giraffe',
    24: 'backpack',
    25: 'umbrella',
    71: 'sink',
    72: 'refrigerator',
    73: 'book',
    74: 'clock',
    75: 'vase',
    76: 'scissors',
    77: 'teddy bear',
    78: 'hair drier',
    79: 'toothbrush',
    80: 'lego'
}
```

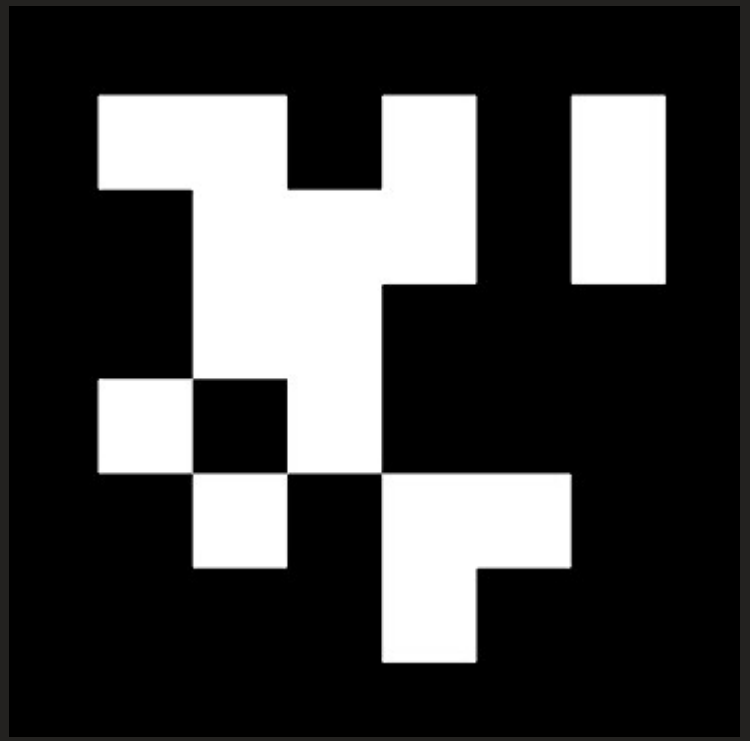

Precision-Confidence Curve
person
all classes 1.00 at 0.871
Precision
Confidence
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0


instances
8000
7000
6000
5000
4000
3000
2000
1000
0
person
car
bench
chair
couch
potted plant
dining table
clock
lego
y
x
height
width


Precision-Recall Curve
person 0.886
all classes 0.886 mAP@0.5
Precision
Recall


Recall-Confidence Curve
person
all classes 0.97 at 0.000
Recall
Confidence

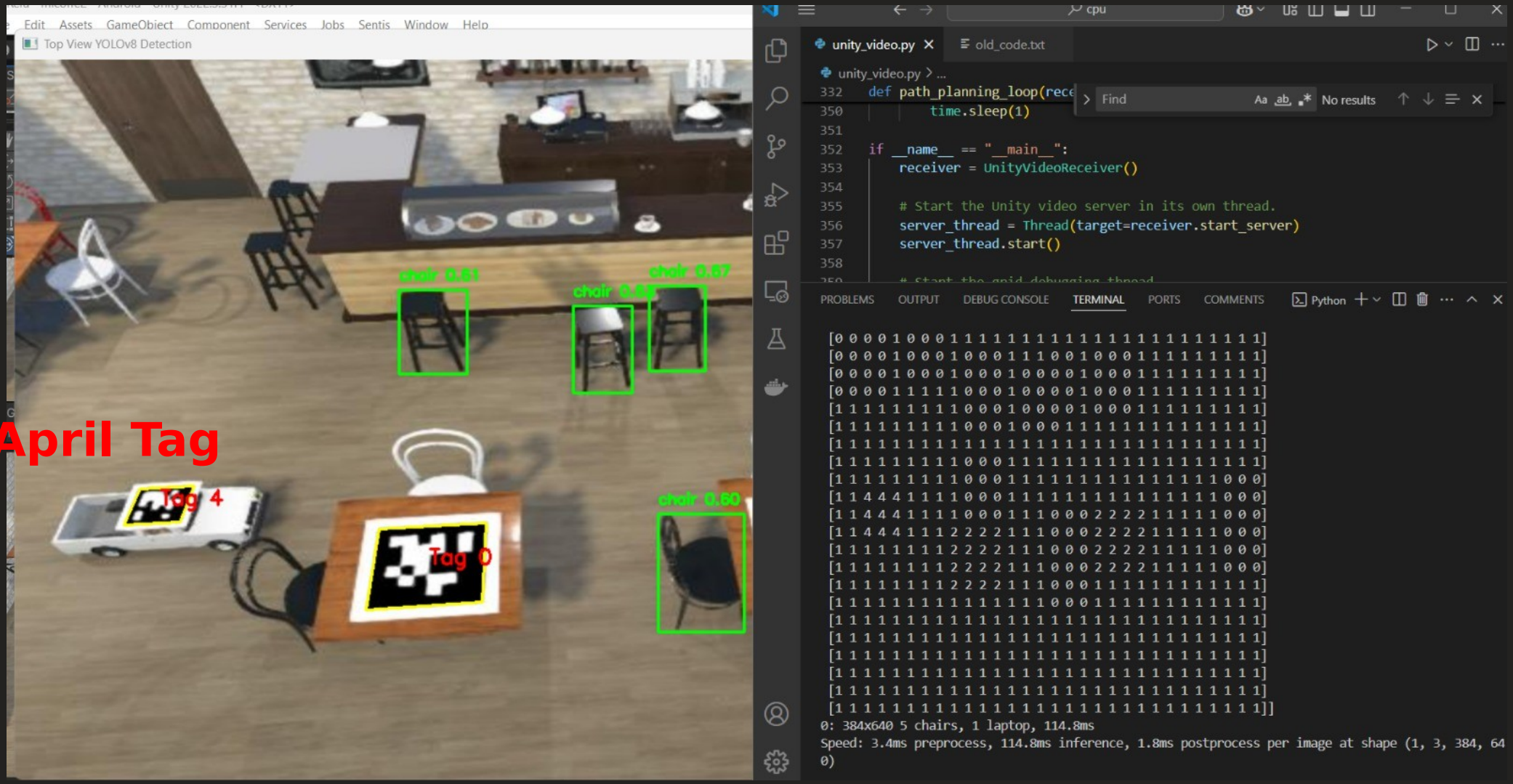
April Tag



tag36h11

https://chaitanyantr.github.io/apriltag.html

Obstacle Detection



Obstacle Detection